Claims

1. A method of cooling a mask frame and screening mask used in a screen printing process comprising the steps of:

providing a cooling section having spaced apart rails or supports on which a mask frame holding a screening mask rests wherein one or more of the sides of the mask frame is cantilevered and can be bent in the space between the rails or supports;

providing a cooling plate in the cooling section having a front side, rear side and opposed sides and corresponding lower surfaces and upper surfaces which lower surfaces contact the corresponding upper surfaces of the mask frame, with at least one of the lower surfaces of the cooling plate being concave downward;

providing means to vertically raise and lower the cooling plate;

moving a heated cleaned screening mask and mask frame to the cooling section;

lowering the cooling plate and contacting the lower surfaces of the cooling plate with the upper surfaces of the mask frame whereby the corresponding sides of the mask frame and cooling plate mate and one or more sides of the mask frame is bent downward because of the concave curvature of the lower surface of the cooling plate;

cooling the mask frame and screening mask with the cooling plate; and

removing the cooled mask frame and screening mask from the cooling section.

2. The method of claim 1 wherein two of the lower surfaces of the cooling plate are concave downward.

3. The method of claim 2 wherein the cooling plate is made from a cylindrical metal plate.

4. The method of claim 1 wherein all the lower surfaces of the cooling plate are concave downward.

5. The method of claim 4 wherein the cooling plate is made from a spherical plate.

6. The method of claim 1 wherein all the lower surfaces of the cooling plate have concave surfaces with the corners being planar.

7. The method of claim 1 further comprising:

providing a screening section having means to apply a screening paste onto a surface of a screening mask secured to a mask frame and which paste is forced through openings in the screening mask to form a pattern on a substrate surface and a cleaning section having means to clean the screening mask of screening paste residue;

a planar mask frame is provided having a front side, a rear side, and opposed sides and corresponding upper surfaces and lower surfaces and a central through opening therein; and

the screening mask is secured to the lower surfaces of the mask frame, the screening mask having mask openings therein in the central opening of the mask frame forming a pattern to be screened onto the substrate surface;

8. An apparatus for cooling a mask frame and screening mask used in a screen printing process comprising:

a cooling section for cooling a cleaned screening mask held in a mask frame, the cooling section having a pair of spaced apart rails or supports on which the lower surfaces of the mask frame rests wherein one or more sides of the frame is cantilevered with the screening mask secured to the lower side of the mask frame being between the rails or posts;

a cooling plate in the cooling section having a front side, rear side and opposed sides, and corresponding lower surfaces and upper surfaces which lower surfaces contact the upper surfaces of the mask frame, with at least one of the lower surfaces of the cooling plate being concave downward;

means to vertically raise and lower the cooling plate;

means for positioning the cleaned mask frame and the screening mask in the screening section;

wherein in the cleaning section, the mask frame and screening mask are cleaned at an elevated temperature and then moved to the cooling section where the cooling plate is lowered to contact the lower surfaces of the cooling plate with the upper surfaces of the mask frame whereby the upper surfaces of the mask frame and corresponding lower surfaces of the cooling plate are mated and at least one of the sides of the mask frame are bent downward because of the concave curvature of the cooling plate and the cantilevered mask frame and the mask frame and screening mask are cooled.

9. The apparatus of claim 8 wherein two of the lower surfaces of the cooling plate are concave downward.

10. The apparatus of claim 9 wherein the cooling plate is made from a cylindrical metal plate.

11. The apparatus of claim 8 wherein all the lower surfaces of the cooling plate are concave downward.

12. The apparatus of claim 11 wherein the cooling plate is made from a spherical plate.

13. The apparatus of claim 8 wherein all the lower surfaces of the cooling plate have concave surfaces with the corners being planar.

14. The apparatus of claim 8 further comprising:

a screening section having means to apply a screening paste onto a surface of a screening mask held on the lower surfaces of a mask frame, the frame having a front side, rear side, and opposed sides and corresponding upper surfaces and lower surfaces, and a central through opening therein; and

a cleaning section having means to clean the screening mask of screen paste residue;

15. A cooling plate for cooling a mask frame holding a screening mask used in a screen printing process comprising:

a thermal conduction plate having a front side, rear side and opposed sides, corresponding upper surfaces and lower surfaces and the plate having one or more downward concave surfaces on the lower surface or surfaces.

16. The cooling plate of claim 15 wherein two of the lower surfaces of the cooling plate are concave downward.

17. The cooling plate of claim 16 wherein the cooling plate is made from a cylindrical metal plate.

18. The cooling plate of claim 15 wherein all the lower surfaces of the cooling plate are concave downward.

19. The cooling plate of claim 18 wherein the cooling plate is made from a spherical plate.

20. The cooling plate of claim 15 wherein all the lower surfaces of the cooling plate have concave surfaces with the corners being planar.